

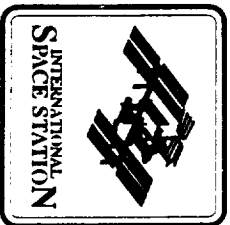


Microgravity Research
Program Office



Abstract

Microgravity Science Glovebox (MSG)



MSG Facility

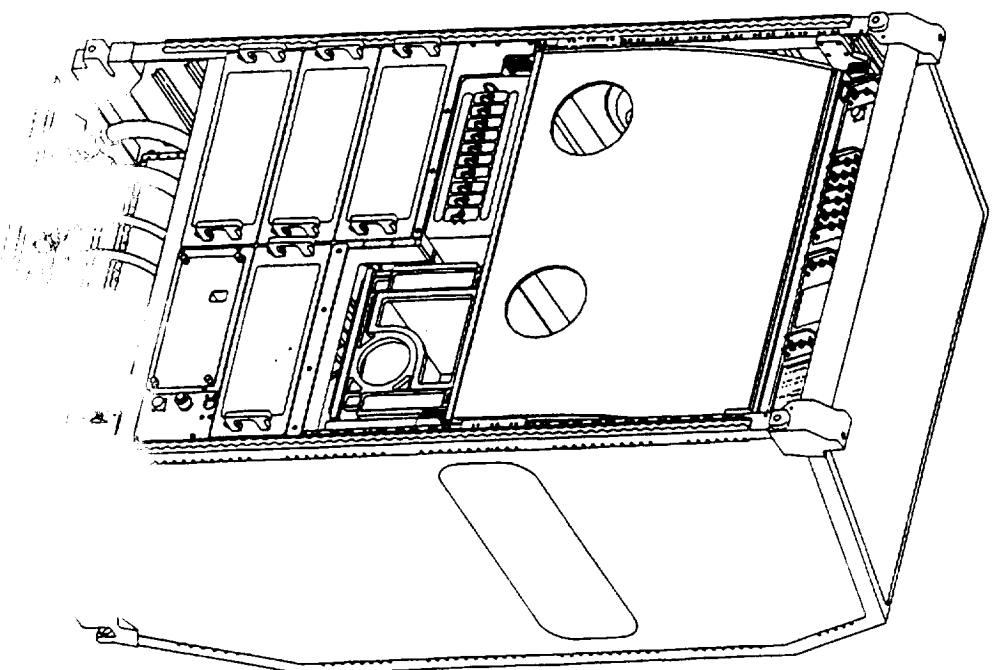
Microgravity Research
Program Office

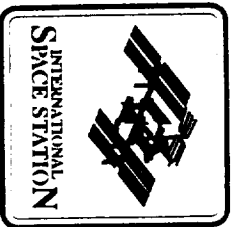


The MSG facility is being developed by ESA as part of the Early Utilization agreement.

The MSG facility is scheduled to launch on UF-2. Although ESA has not officially committed to a UF-2 launch, they have instructed their contractors to take all necessary actions to prepare for a UF-2 launch date.

To date, five MSG investigations have been selected (three for UF-2 and two for UF-3). Numerous other principal investigations and commercial experiments are considering the use of MSG.



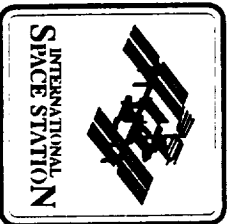


Background

Microgravity Research
Program Office



- MSG is a third generation glovebox for Microgravity Science investigations:
 - Spacelab Glovebox (GBX)
 - Middeck/MIR Gloveboxes (M/MGBX)
 - GBX and M/MGBX developed by Bradford Engineering (NL)
- Previous flights have demonstrated utility of glovebox facilities:
 - Contained environment enables broader range of science experiments
 - Affords better control of video and photographic imaging (a prime data source)
 - Provides better environmental control than cabin atmosphere
 - Useful for contingency operations
- MSG developed in response to demands for increased work volume, increased capabilities and additional resources. MSG is multi-user facility to support a wide range of small science and technology investigations:
 - Fluid physics
 - Combustion science
 - Materials science
 - Biotechnology (cell culturing and protein crystal growth)
 - Space processing
 - Fundamental physics
 - Technology demonstrations



MSG Capabilities

Microgravity Research
Program Office



Work Volume	260 liters, 920 mm wide x 650 mm high x 500 mm deep (at the floor)
Maximum Size of Exp. Item	406 mm diameter x 406 mm high (WV side port access); 260 mm wide x 350 mm high x 300 mm wide (Airlock access)
Power Available to Experiments	28 V at 7 amps +/- 12 V at 2 amps 5 V at 4 amps 120 V at 8.3 amps (Maximum power draw from all outlets is 1 kW)
Max. Heat Dissipation	1000 W (800 from WV coldplate, 200 W from air circulation)
General Illumination	975 lux
Video	Color and B&W cameras; dedicated recorders
Data Handling	RS422 between investigations in WV and PCS Two MIL 1553B connections between MSG and PCS (one inside WV) 8 analog and 8 discrete signals inside WV 2 Ethernet connections inside WV HEPA/charcoal/catalyst filters; replaceable on-orbit
Air Filtration	
Other Resources	Nitrogen; Vacuum



MSG Hardware Items

Microgravity Research
Program Office

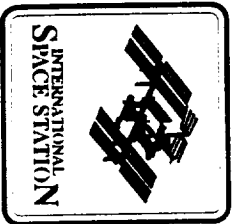


FLIGHT UNIT: The flight unit will be produced according to NASA functional requirements and performance specifications, including those for provision of a video system, fully integrated into an ESA-provided flight rack that meets International Standard Payload Rack (ISPR) specifications and interface requirements.

GROUND UNIT: The ground unit will be a functional simulator dedicated to protocol development and experiment testing. It will be functionally equivalent to the flight unit and all of the experiment and crew interfaces to the ground unit shall be of high-fidelity.

TRAINING UNIT: The training unit will be a mock-up unit supporting whole Station training, including malfunction simulation and front panel crew interfaces. (The training requirements and the fidelity of the training unit are under review)

ENGINEERING UNIT: The engineering unit will be of sufficiently high fidelity to support sustaining engineering functions such as anomaly resolution (hardware and software) and verification of system operational changes during on-orbit operations. To achieve these objectives, all functions, interfaces, and hardware configuration shall be flight identical.



MSG GSE and OSE Items

Microgravity Research
Program Office



• GSE:

- Shipping containers
- Rack stand
- Water chiller
- Vacuum supply
- Gas supply
- Power supply
- Sun Sparc computer

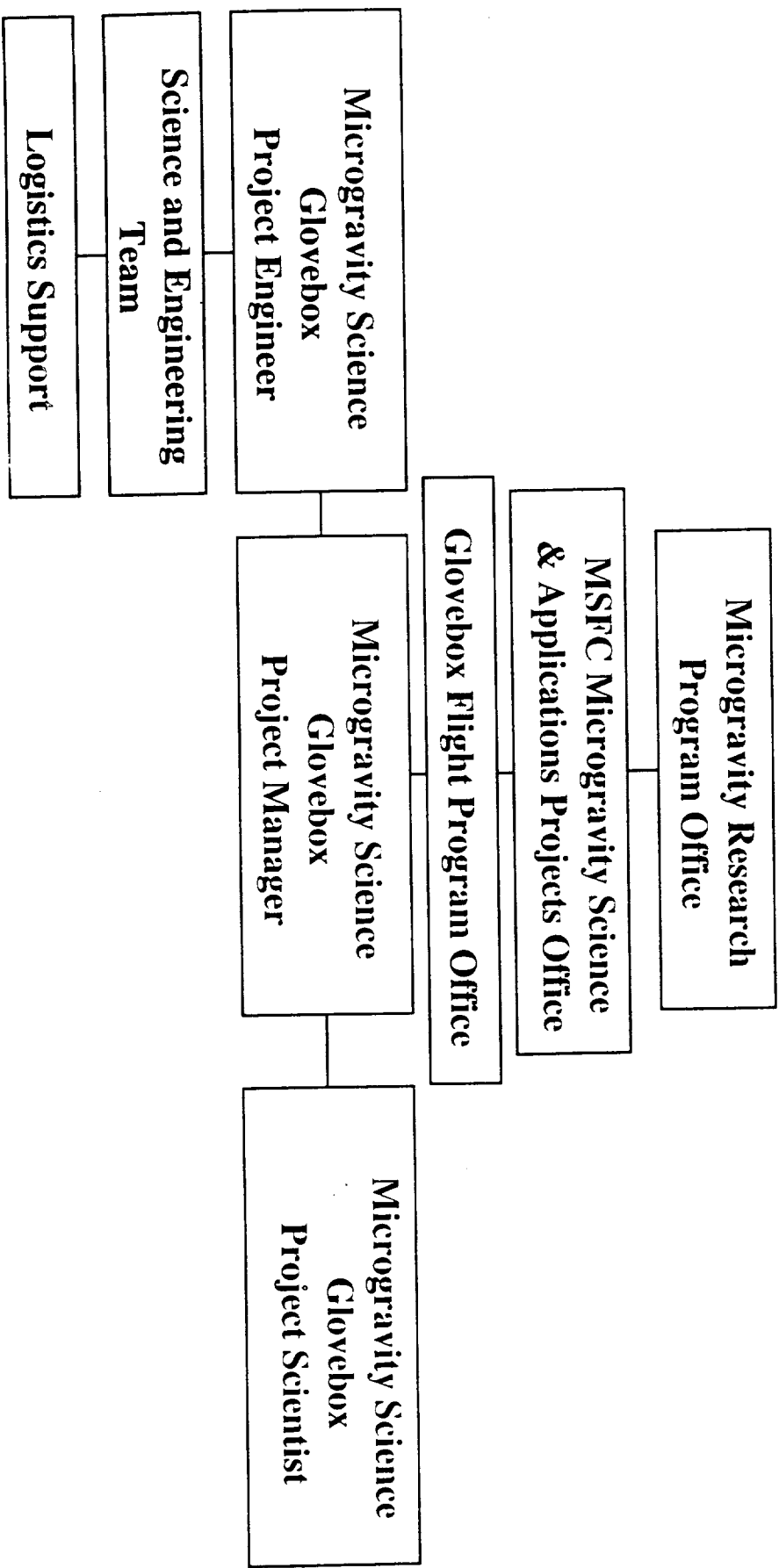
• OSE:

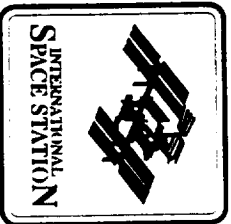
- WV slide locking tool
- Outfitting equipment:
 - Stowage drawer liners
 - Gloveport plug
 - Filter cap
 - Spotlight
 - Scavenger pump
 - Extension hose
 - Suction nozzle
 - Cleaning nozzle
 - Stray light cover
 - Lab jack
 - IR window port
 - Small parts container
 - Bungee cord restraint
 - Goggles
 - Plastic sheet
 - Camera



MSG Development Approach

- MSG is being developed through an international agreement between NASA and ESA. NASA is providing ESA early utilization opportunities in exchange for the MSG facility. The MOU stipulates no exchange of funds between NASA and ESA.
- MSFC has been assigned as the lead center for the development of MSG.





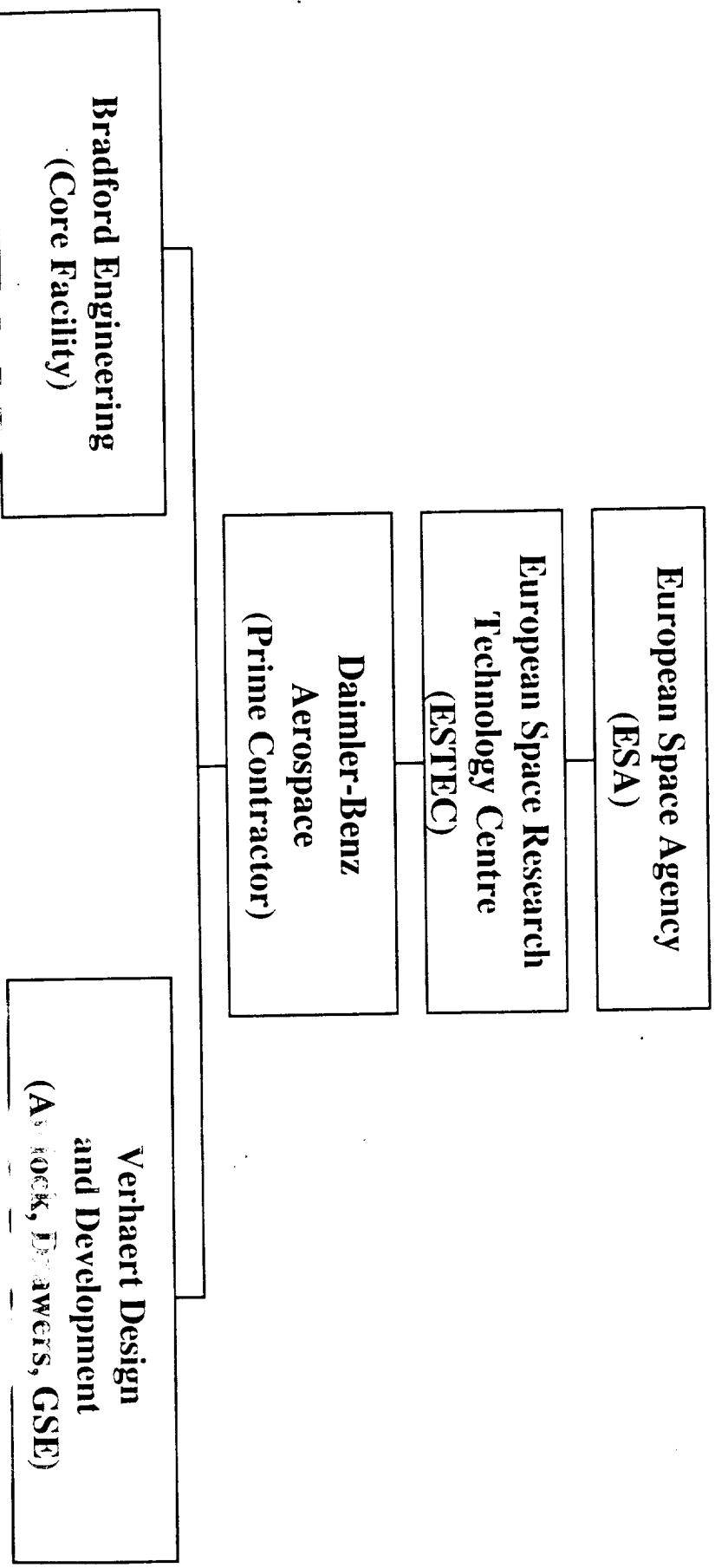
MSG Development Approach (Cont.)

Microgravity Research
Program Office



- ESA/ESTEC has a fixed-cost contract with DASA for the MSG design, development and support. Bradford Engineering also developed the Spacelab, Middeck and MIR gloveboxes.

ESA ORGANIZATION





MSG Development Approach (Cont.)

Microgravity Research
Program Office



• MSG is using a protoflight approach. Qualification testing of the facility will be conducted in Europe. ESA's current plan is to perform interface verification testing in Europe using NASA-provided or NASA-approved equipment. Acceptance testing will be a phased process. ESA will conduct acceptance testing in Europe when the facility is delivered to ESA by the contractor. Additional post shipment acceptance testing will be conducted at KSC. Final acceptance testing will be conducted on-orbit.

• Currently, MSG plans to provide facility and investigation operations support on an as needed basis. During scheduled usage, MSG will monitor communications and facility/investigation parameters. A point of contact will always be available should the crew or ground personnel need support. A significant amount of ground troubleshooting can be achieved via health and status monitoring. The Engineering Unit will be used, as necessary, to assist in troubleshooting.

ESA 3S 3C
will integrate the
investigations.



Science Utilization

Microgravity Research
Program Office



- Unique Equipment for Experiments:

Each investigation will provide unique equipment to be operated in the MSG facility. Very little commonality of hardware between investigations is anticipated.

- Support for PIs:

Glovebox investigations will be selected approximately every two years through an announcement of opportunity. The MSG program will be responsible for defining and coordinating interfaces between the investigations and the facility.

Date Logged 6/24/99

Work Order Number

Availability Publicly available

Project Number

Author 1 Wright, M.E.

SD43

Author 2

Author 3

Author 4

Author 5

Author 6

Author 7

Author 8

Author 9

Author 10

Contractor

Print

Contract Number NAS8-

☒ Yes ☐ No

Presentation Microgravity Science Glovebox (MSG)
Publication Title

Presentation Location American Glovebox Society Conference, San Francisco, CA

Presentation Date July 19-21, 1999

Publication Location

Publication Date

Forw. Date

Return. Date

COTR Name

Lab Dir. Name SD40/B.J. Jackson approved 06-11-99

Hdq Approval Code Blanket approval CODE U 09-23-94

IRD Approval Required

MSFC CEA Rep SD10/Robin Henderson approved 06-17-99

CA10 Name Medal

6-24-99

AT01S Name Turner

Date Approved Disapproved

Comments

Data Logged By Betty Fowler

Date Modified Jun 24, 1999

Date Modified by Betty Fowler